Volume 10

Technical parts and service information published by Ford Division to assist servicemen in Service Stations, Independent Garages and Fleets.

All 12 Issues

The complete collection of Volume 10 "Shop Tips"

- How-To Articles
- Reference Guides
- Specifications
- Part Identification
- TSB information

Each issue is jammed packed full of shortcuts, tips, and tricks to make repairs fast and easy.

Articles are written in plain, straight-to-the-point fashion and provide simple solutions to common problems

Great source of Shortcuts, Tips, and Tricks

Covers both Car and Truck models!

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INTRODUCTION TO THE 72'S

Here in one publication you'll find a host of basic technical information on the 1972 Ford and Lincoln-Mercury Division cars and trucks. This information and the service specifications listed for each model will be of great help to you during the coming months and of course an invaluable reference source for the future.

And, so that you can discuss the 1972's with your customers and others who may ask specific questions, we have devoted a number of pages to New Car Technical Features.

Also, in response to field requests for new car and truck information that can directly help service Ford products, the major portion of this issue covers such service oriented details as: Service Locations for the hood release, gasoline, oil and PCV valve; Lights and their candlepower and basic bulb trade number; Circuit Protection which includes fuse ratings and circuit breaker limits; Refill Capacities for all operating units in the drive train; Service Tips to help you in tune-up work; Engine Specifications for comparison with other powerplants; plus Performance Specifications that you'll find valuable during diagnosis, making adjustments, and in the control of exhaust emissions.

Keep this copy handy and refer to it often. It will make your job easier keeping Ford, Mercury and Lincoln passenger cars and Ford trucks at peak performance . . . all during their life.

Motorcraft

Of the newest and the most interesting information, tied in with the 1972 models, is the introduction of the name Motorcraft for original equipment parts on Ford-built cars and trucks.

All previously branded Autolite parts, (except spark plugs) will make their first appearance as production installed items under the new brand name, Motorcraft. We urge you to read pages 4 and 5 of this issue, so that you will have knowledge of the major change that has taken place at Autolite-Ford Parts Division.
**1972 FORD DIVISION NEW MODELS**

The full size Ford for 1972 has a fresh new front and rear end appearance.

Interior features include a new 12-inch-wide inside rear view mirror, high back bench seats standard on all LTD Brougham models (eliminating the need for separate head restraints since they are nearly eight inches higher than regular seats), and a wide pull-down center armrest which adds to the driving comfort of both passenger and driver.

The full size Ford power team is revised over the 1971 offerings. Both the 390 and 429 V-8 2V engines have been excluded due to the popularity of the 400 cubic inch displacement, 2V powerplant. Ford’s highly touted and expertly engineered 351 V-2 is the standard V-8 engine for 1972.

Wheelbase is 121.0” for all full size Ford models, with a front tread of 63.3” and rear tread 64.3”. Turning diameter (curb to curb) is 41.2 feet.

**Torino for 1972** features the biggest change since it was originally introduced as the 1962 Fairlane. Both the chassis and sheet metal are all new. Underneath the new body is a solid, perimeter type frame...the first separate body-and-frame construction for the Torino. Helical coil springs are used for both front and rear suspension systems.

A shorter 114” wheelbase is employed in the two-door models with the 118” wheelbase standard on all four-door models.

Turning diameter (curb-to-curb) is 41.7 feet while front tread is 62.8” and rear tread is 62.9” on all Torino models except the station wagons. The four-door wagon has a front tread of 63.9” and a rear tread of 64.0”.

Front disc brakes are standard along with side impact protection built into the doors.

All engines for the Torino’s will run on regular fuel of at least 91 octane when tuned to factory specifications. This includes the 429-4V power plant.

**1972 full size Mercury** is distinctively new with a full width front grille design and cooling slots in the bumper for more ram air into the engine compartment.

The Select-Shift automatic transmission is standard on all full size Mercurys. Power steering is standard equipment on the Monterey models.

Body construction for all 1972 Mercurys is designed around a perimeter frame and rigidized body sheet metal. Steel guard rail door reinforcements are incorporated in all models.

Wheelbase on the two-door and four-door models is 124.0” while station wagons are 121.0”. Turning diameter for the 124” wheelbase models is 42.9 feet, while the 121.0” wheelbase models will make the tight turn in exactly 42.0 feet.

Tread on all 1972 full size Mercury models is 63.3” for the front and 64.3” for the rear.

**The 1972 Montego** Mercury’s intermediate size passenger car, is entirely new for this model year.

Most noticeable in the design changes are the long hood/short rear deck styling.

Montego now has a fastback model; the Montego GT.

The sleek and clean looking Montego bodies are now supported by a tough, torque box perimeter frame. Coil spring suspension is used front and rear. All models are slightly lower and have a wider stance with a front tread (62.8”) that is 2.3” wider and a rear tread (62.9”) that is 2.9” wider.

Manual front disc brakes (non-powered assist) and rear drum brakes are standard. Power assist is available as an option.

**Cougar for 1972** offers new safety features, improved emission controls and other refinements and improvements.

Unitized body construction gives the Cougar bodies strength and rigidity while the driver and passengers are protected by...
Mustang for 1972 has a new engine lineup and a number of comfort and convenience features.
A 351-4V HO (High Output) engine is available in all Mustangs. This powerplant has a high lift cam, mechanical valve lifters, four-bolt main bearings, forged aluminum pistons and an electronic timer.
Other features include fully concealed windshield wipers, flush door handles, thin shell design high-back bucket seats, standard console with pull-out ash tray, optional rear window electric defrost system, and DirectAire ventilation with four instrument panel air registers.
On all Mustang models the wheelbase is 109.0" with a front tread of 61.5" and a rear tread of 61.0". Turning diameter (curb-to-curb) is 39.8 feet.

The Maverick has a number of significant refinements to improve the automobile.
The rugged unitized body on a platform chassis has many Zinclad underbody components and zinc-rich primer applications for rust and corrosion protection.
Wheelbase of the two-door sedan is 103.0", while the four-door sedan is stretched to 109.9". Turning diameter of the two-door sedan is 36.0 feet (curb-to-curb).
Options for 1972 include radial ply tires (DR78-14), a heavy-duty suspension system, sporty-looking high-back bucket seats and four vinyl roof colors...black, white, red and green.
Standard size tires and wheels are 14-inch.

Thunderbird for 1972 makes its appearance with major exterior and interior changes in a single-model offering; a two-door hardtop with wider rear roof pillars and smooth-flowing body contours. The significant engineering change this year is the introduction of a new frame and a new suspension system.

For 1972

side door steel guard rails. These box beam structures are designed and built into both doors and in the event of a side impact, they provide improved impact absorbing qualities and help resist passenger compartment penetration.
Power assisted front disc brakes are available as a factory installed option.
Front fenders now have plastic splash shields to combat corrosion.
Turning diameter (curb-to-curb) is 41.4 feet while front tread is 61.5" and the rear 61.0".

Comet for 1972 continues its strong entry in the compact car field by a number of refinements and improvements.
Overall dimensions are unchanged for 1972.
Front suspension is the independently sprung coil spring type while the Hotchkiss drive rear suspension employs semi-elliptic leaf springs (3 spring leaves) 55" long and 2.5" wide.
Turning diameter is 36.9 feet in the two-door models and 37.7 feet in the four-door sedan.

The popular sports coupe, Capri, first introduced in the U.S. in April, 1970, boasts a first-year sales performance of over 30,000 vehicles.
Front suspension consists of variable rate coil springs while the rear suspension system uses three elliptical spring leaves for each rear wheel.
Rack and pinion steering is only 3.3 turns lock-to-lock.
Power assisted brakes are standard with discs at the front and drums in the rear.
Two engines are offered for 1972. The standard Capri is equipped with a 1600 cc OHV four cylinder engine and a four-speed manual transmission. A more powerful 2000 cc SOHC engine is available with the four-speed manual transmission or the optional three-speed Select-Shift automatic transmission.
Radial ply 165 x 13 BSW tires are standard.
Wheelbase is 100.8", rear tread is 52.0" and front tread 53.0".

Continental Mark IV for 1972 is longer and lower than former Mark III models, with sheet metal and grille all new for '72.
All new taillamps have been moved from the rear quarter panel (1971) to the rear bumper.
Again Michelin radial ply tires will be continued as a standard feature for 1972.
A smart new styling touch has been added with the addition of a "stand-up" hood ornament that is spring loaded for safety.
Add to all this a 460-4V powerplant, a Select-Shift automatic transmission and a Sure-Track brake system with power disc front and rear drum as standard brake equipment and you have the last word in a fine motor car.
Wheelbase is 120.4" (up 3.2" over last year) suspended between a front tread of 60.0" and a rear tread of 63.1". Turning diameter is 42.0 feet (curb-to-curb).

The 1972 Lincoln Continental features exterior appearance refinements and more standard equipment, such as Michelin WSW 225 x 15 radial ply tires, new side ornamentation, a new hood ornament with safety fold-down feature and new taillights.
A steel "Guard Rail" is welded in position in all doors.
The 460 4V engine is standard as well as the 2.80:1 rear axle ratio. The 3.00:1 ratio is optional for '72.
Wheelbase for sedans and coupes is 127.0" while both front and rear treads are identical...64.3".
INTRODUCING Motorcraft our new brand of automotive parts, you knew them as Autolite
ONLY THE NAME HAS BEEN CHANGED

Motorcraft is now the brand name for all automotive parts that were formerly labeled Autolite with the exception of spark plugs which will continue to be branded Autolite.

Previously branded Autolite parts will make their first appearance under the name Motorcraft when Ford introduces this new name for original equipment with their new 1972 models.

This means built-in customer acceptance and a huge replacement business potential. Because Motorcraft and Autolite are INTERCHANGEABLE, current stock is as saleable as ever for 1972 original equipment replacement and for more than 25,000,000 earlier model, Ford-built vehicles on the road.

The large and broad automotive scope of Motorcraft parts includes the following:

FAST MOVING MOTORCRAFT PARTS LINEUP
Electrical Tune-Up Kits • Batteries • Shock Absorbers • Carburators • Carburetor Tune-Up Kits • Oil Filters • Air Filters • Fuel Filters • Alternators • PCV Valves • Radiator Hose • V-Belts • Gaskets • Oil Filler Caps • Gas Caps • Generators • Starter (and other) Motors • Coils • Point Sets • Condensers • Rotors • Distributor Assemblies • Distributor Caps • Switches • Complete Ignition Repair Parts • Wire and Cable • Heater Hose • Thermostats • Radiator Caps

PARTS DISTRIBUTION
Motorcraft parts are backed by a large and sophisticated distribution system. The Autolite-Ford Parts Redistribution Center near Detroit occupies nearly 70 acres under one roof. An electronic data processing system is connected with 20 field parts distribution centers all across the U.S., to help speed delivery of parts.

SAME PART NUMBERS
Motorcraft and Autolite have the same part numbers. When we decided to change the name, we also decided to make it easy for everyone in the parts and service business. So, when you place an order for Motorcraft parts simply use the familiar Autolite number.

For spark plug replacement continue to order Autolite.

MIXED SHIPMENTS
During the changeover period you may receive parts or shipments containing both Motorcraft and Autolite brand names. However, the box design, part numbers and parts themselves will all be the same.

Ordering, handling and stocking remain unchanged!

COMPLETE PARTS LINE...
COMPLETE NEW NAME
Now that you know about our name, let us tell you about our products. As you probably have heard, we have a complete parts lineup. What you may not know is that many of the parts within the category shown in the parts lineup listing offer you exceptionally broad application selection and installation opportunities. Another thing that you can't see is all the Ford engineering know-how that went into these parts. But it's there!

CUSTOMER ACCEPTANCE
Motorcraft parts are built with real sales appeal to the motoring public. They're performance-proved on the world's finest testing facilities to meet exacting Ford engineering standards. And at major races like the Indy 500, where Autolite spark plugs have powered winner after winner.

PACEMAKER
The Pacemaker Program is a continuing incentive for anyone in parts sales and installation. This program features prize and travel points ... plus special incentive and merchandising help to assist you to sell and install more Motorcraft parts.

HUGE OPPORTUNITIES
Motorcraft offers you great opportunities for the big replacement business on popular GENERAL MOTORS, CHRYSLER and AMERICAN MOTORS models plus many of the top imports.

Motorcraft has a broad line for all of them, including performance-proved Autolite spark plugs!
All Ford and Lincoln-Mercury Division passenger cars and light trucks (under 6000 GVW) use the **IMPROVED COMBUSTION** system to control exhaust emissions of hydrocarbons and carbon monoxide.
FEATURES...

In addition, all vehicles delivered in the State of California include an IMCO system that also controls emission of oxides of nitrogen. The California system is optional in all other states. In all, there are over 100 variations of the IMCO system used on Ford-built vehicles.

Two that will be discussed here are the ELECTRONIC SPARK CONTROL SYSTEM and the TRANSMISSION REGULATED SPARK SYSTEM.

FEATURE—This Electronic Spark Control System is mainly used on automatic transmission equipped vehicles in the State of California. It consists of an electronic speed sensor located in series in the two-piece speedometer cable...a solenoid operated vacuum switch which controls the carburetor spark port vacuum to the distributor, and an ambient (outside air) temperature switch connected to a ground.

This device reduces emissions by delaying vacuum spark advance at the distributor at critical lower vehicle speeds.

The speed sensor in the speedometer cable supplies a frequency signal to the electronic module. This signal activates the electronic module and solenoid vacuum switch so that the distributor vacuum line closes at speeds BELOW 18 mph on deceleration, and is closed BELOW 23, 28, or 33 mph (depending on the engine) on acceleration.

The electronic amplifier functions as a switchboard that controls the system by the messages it receives from the speed sensor or the temperature switch.

The vacuum valve controls carburetor venturi vacuum to the distributor primary advance diaphragm. The vacuum valve is normally open to provide normal vacuum advance until the Electronic Spark Control System is activated. Then the valve snaps closed, shutting off the venturi vacuum from the carburetor, thus retarding the spark.

It should be noted that on some applications the vacuum hose connections between the carburetor and distributor may route through the PVS valve. This Ported Vacuum Switch serves as a by-pass or safety override switch. When the engine coolant temperature exceeds 230°F, manifold vacuum is applied directly to the distributor, thereby providing vacuum advance to the distributor.

The temperature switch controls the power input to the electronic amplifier, determining when the amplifier will function. Anytime the outside (ambient) air temperature is below 49°F, the switch contacts are OPEN. Above 60 degrees, the switch is CLOSED. It is also possible for the contacts to be either open or closed within the range of 49 to 55 degrees.

The speed sensor consists of a rotating magnet and a stationary winding. As the magnet rotates, it causes a voltage frequency in the field winding that is proportional to the speed of the magnet (or vehicle).

In operation, power is supplied to the electronic amplifier via the temperature switch. When the outside temperature is 49 degrees, or lower, the temperature switch contacts (being open), do not allow the power from the ignition switch to reach the amplifier, thus it does not become energized. The de-energized vacuum valve being normally open, passes carburetor venturi vacuum to the distributor diaphragm (primary side), to provide normal vacuum advance.

When the outside temperature is above 60 degrees; the temperature switch contacts close and power from the ignition switch circuit reaches the amplifier, thus closing the vacuum valve to cut off distributor spark advance. As the vehicle begins to accelerate, a frequency is generated by the speed sensor. When the vehicle speed reaches the approximate operating limits of 23, 28 or 33 mph (depending on engine application), the electronic amplifier is triggered by the signal from the speed sensor to de-energize the vacuum valve, restoring distributor spark advance from the carburetor spark port to the distributor primary diaphragm.

When vehicle speed decreases to approximately 18 mph, the electronic amplifier responds to close the vacuum valve. Therefore, at that speed and below, no vacuum is applied to the primary side of the distributor and the spark is retarded.

FEATURE—This system is used on most automatic transmission equipped vehicles... except in the State of California. It consists of three major units. One, an electric switch on the transmission that senses third gear (direct drive range) hydraulic pressure. Two, an electric solenoid operated vacuum switch that controls vacuum to the carburetor spark port vacuum to the distributor and three, an ambient temperature switch. It also controls emissions in the critical lower vehicle speeds by preventing part throttle spark advance in second and third gear on acceleration... and also when the vehicle downshifts on deceleration.

Another version of this TRS System is used on manual transmission equipped vehicles in the U.S. It operates the same as the one for automatic transmission equipped vehicles except the operating switch is in the transmission linkage.

This TRS circuit consists of a temperature switch, a transmission switch, a vacuum valve, and related wiring. The individual components determine when the system will operate.

This system reduces the exhaust emission of an engine by retarding the distributor vacuum advance while the vehicle is in first and second gear. The TRS system is controlled by transmission operated switches which activate the solenoid valve and advance the spark when the vehicle is in high gear.

Since the valve is normally open, there is no vacuum retard action directed to the distributor until an electrical control circuit is added.

The vacuum control valve is a normally open control valve inserted in the vacuum line between the carburetor spark port and the distributor primary vacuum advance diaphragm. When the valve is energized, the valve closes and the vacuum supply from the carburetor to the distributor is sealed off, thus eliminating vacuum advance.

On some applications, the vacuum line between the carburetor and distributor may be routed through the PVS valve. A bimetal ambient temperature switch is used to sense outside air temperature. For this reason, it is located in the outside of the "A" pillar of the vehicle and isolated from passenger or engine compartment heat. The switch contacts are designed to break the TRS system electrical circuit and allow normal vacuum advance in all gears, whenever the outside temperature is below 49°F. These same contacts are designed to close in the temperature range of 60°F.

The function of the transmission switch is to provide a ground for the TRS system, thereby completing the circuit. There are two types of such switches. The switch for the manual transmission is self-grounding and normally closed. It opens when the transmission shift rail enters top gear position. The switch for the automatic transmission is self-grounding and normally closed. It opens when third or reverse servo oil pressure is introduced.

The power supply from the ignition switch wiring is only available through the Temperature Switch and then only if the temperature of the outside air exceeds 55°F. Under these conditions, the switch contacts are closed and the TRS System is energized, retarding vacuum advance. At temperatures below 49°F, when the Temperature Switch contacts are open, the TRS System is not energized, thus allowing the vacuum advance system to function normally.
FEATURE—This new Torino frame has been designed to accommodate and complement the new Torino body. The frame side rails fit into the body between the rocker panels, permitting a low entrance height for passengers and a flatter floor.

The frame front rails have the Ford-pioneered "S" shape to absorb more energy in the event of a heavy impact. The frame front crossmember is located behind the front of the frame in a position to increase the effective collapse length and energy absorbing ability.

Integral torque boxes are located at the rear of the front rails where they join the side rails.

These torque boxes permit minor flexing of the frame for a reduction in road noise and harshness. Integral torque boxes are also formed in the frame rear rails where they join the center rails.

A special feature of the Torino frame is the mounting point for the rear suspension lower arms. These arms are attached inside the frame rails, thus providing maximum room in the rear area.

FEATURE—The 1972 Torino also features a new concept in suspension design. It is also a major reason for Torino's smooth, quiet ride and excellent road "hugging" characteristics. The system features coil springs, upper and lower links and angle mounted telescopic shock absorbers.

Steel channels make up the lower links. They are connected to a pocket in the frame rail and to a bracket underneath the axle. Drawn steel bars make up the upper links. These bars are connected between a bracket on top of the axle to the frame number "4" crossmember. Ends for both upper and lower links are mounted in "Silent-Bloc" rubber bushings.

All four links absorb acceleration and braking forces. And, due to the geometry of this new four-link system, the roll center is only 8 inches off the road... lower than any other domestic car with coil link type rear suspension.
LIGHTING SYSTEMS...
Tips on Servicing
Many of 1969 to 1972 Ford-built passenger cars have more than 50 lamp bulbs and hundreds of feet of wiring in their lighting systems. And coupled with all this are protective devices such as fuses and circuit breakers.

These “sentries” of the electrical system are inserted in the wiring system to protect electric motors, switches, relays and of course the actual wiring, from overloads, short circuits and burn-out.

Some of the larger passenger cars such as the Mark IV and the full-size Ford and Mercury have as many as 10 circuit breakers ranging from a small 1-ampere rating up to a larger 35-ampere rating.

Circuits with 10 fuses are not uncommon. And, interesting enough, each of these fuses protects more than one circuit. For example, the 1972 Mercury uses a 4-ampere fuse to protect all of the instrument cluster lights, the clock light, the steering column light for the PRND21 shift quadrant, the radio light, the heater A/C control lights, and the ashtray light. Quite a job for such a small fuse and yet it is a vital part needed to guard bulbs and their wiring circuits.

As you know, fuses are available in a wide range of standard sizes and amperage rating which have been set by the Society of Fuse Engineers (SFE).

When it comes to light bulbs, unlike many other parts and units of a car or truck, the light bulb’s “life” (its service life) is measured in hours of actual usage. Rough usage, severe driving conditions and excessive line voltage shortens the number of service hours that the bulb functions.

Servicing car and truck lighting systems and bulb replacement is generally a fairly easy job. Too, it is not a difficult service to sell to the motoring public. More importantly, having all lights working properly is vital to highway safety.

Often the motorist is not aware that a bulb has burned out. If you spot the burn-out, the average driver is usually agreeable to having the bulb replaced with a new one, or the wiring repaired, the terminals cleaned, or the fuse replaced.

During a recent year, 83,000,000 sealed beam lamps were manufactured along with 617,000,000 other bulbs for stop lights, panel lights and parking lights for example.

WHAT A MARKET!

To get your share of this tremendous market potential, make it a habit to check all lights on every car that comes in for one kind of service or another. You will also be doing your full share in making highway driving safer for everyone.

Remember this—lamp design today is greatly improved over design of only a few years ago. These improvements can be sold to owners of older cars who will then benefit from the improved headlights and other smaller bulbs available.
LIGHTING CIRCUIT

All Ford-built passenger cars (with a 12-volt battery) use a negative ground system. This means that the negative terminal of the battery is grounded as shown in Figure 1.

By “ground” we mean that the metal parts of the car are used to complete the electrical circuits rather than many return wires running back to the source of power which is the battery.

This “common ground” method is used in all automotive electrical systems so that only a single wire is needed to conduct electrical power to the load...which can be a motor...a bulb...a relay and so forth.

The electrical circuit, as shown, will operate the load since the battery and the load are both grounded to the chassis of the car. Thus, the chassis is used to complete the circuit.

The ground wire does not have to be insulated because the common ground is not insulated. And, the load itself may be self-grounded. Many light bulbs are grounded by the contact of their sockets with the car.

Open circuits can be caused by poor ground connections. These “open circuits” can also result from breaks or other open conditions in the wire conductors.

All feed or “hot” wires must be insulated. If the insulation breaks or chafes through and the hot wire touches a metal part of the car, this condition causes a “short circuit.” The end result is a blown fuse or a circuit breaker that starts its “make and break” action.

Electricity flows whenever the circuit or flow path is closed...that is, whenever the circuit is complete. An open point in the circuit (may be a switch in the OFF position) stops the flow and the load (bulb for example) does not operate. This is an “open circuit.”

A “short circuit” is a path for electricity that wasn’t designed into the system. It is a condition that happens accidentally. A short occurs when a “hot” conductor contacts another conductor or is grounded because of faulty insulation or insulation that gets chafed or cut so that bare wires contact metal surfaces.

Figure 1—Here is a simple electrical circuit that is the basis for more complicated circuits found in modern passenger cars. However, most circuits today are the parallel type so that multiple loads can operate from the same power source. Parallel electrical systems operate independently from each other as long as the main feed is intact from the power source to the common electrical supply point.

Figure 2—Here is a 1972 Ford showing that modern American produced passenger cars use a multitude of light bulbs to illuminate everything from the roadway to the ashtray and almost everything in between. Statistics have shown that nearly 80 percent of all older model cars safety checked have some kind of lighting defect or problem. Almost 50 percent of all lighting defects consist of burned out or mis-aimed headlights. Others include burned out small bulbs...damaged or broken lenses, corroded, rusted or damaged connectors or housings, and burned out fuses and turn signal flashers.
HEADLIGHTS

The Maverick, Comet and Mustang use TWO No. 2 sealed-beam headlights. Each of these lights has a low-beam and a high-beam filament. On all other Ford-built car lines, FOUR sealed-beam headlights are used. See Figure 3.

The two outboard lights have TWO filaments each . . . one for the low beam and one for the high beam. The number "2" is molded into the glass lens. Locating tabs molded into the glass allow the mounting of the No. 2 headlights in the outboard support frames only. The low beams are used for city driving and when meeting oncoming traffic on the highway.

The inboard headlights with a number "1" molded into the glass lens have only one filament. They are used for highway driving together with the high beam filaments of the No. 2 headlights. Locating tabs molded into the glass allow the mounting of the No. 1 headlights in the inboard headlight support frames only.

HEADLIGHT SWITCH

A combination switch, having three positions, is mounted at the lower left of the instrument panel. This headlight switch controls the electrical circuits to the headlights, parking lights, marker lights, courtesy lights, taillights, license plate light and instrument panel lights. An 18-ampere circuit breaker in the switch protects the headlight circuit while a 15-ampere circuit breaker in the switch protects circuits for the taillights, the license plate light, the parking lights and the marker lights.

SMALL BULBS

Minature bulbs are used for the majority of lights (other than headlights . . . fog lights . . . road lights). These smaller type bulbs are available in the following base designs: Single contact bayonet base . . . double contact bayonet base . . . double contact bayonet base with staggered indexing lugs and in some installations, such as dome lights . . . the cartridge type is used. See Figure 4.
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FORD-BUILT VEHICLE IDENTIFICATION

Ford offers such a vast choice of models and optional equipment, that your ability to make proper identification before servicing power train components on both cars and trucks is extremely important. This information is also vital when ordering needed parts.

Knowing exactly what model, series or piece of equipment you are servicing will eliminate guesswork and permit you to apply the proper factory specifications when adjustments, maintenance, service or overhaul procedures are called for.

Understanding the code system Ford uses for 1972 and all other prior years will also help to eliminate lost time or confusion.

Vehicle codes are listed on the Vehicle Identification Plate, the Rating Plate, and the Safety Standard Certification Label. "Reading the Code" is simple, once you understand what the letters or numerals represent. This issue of Shop Tips is designed to do just that.

The safety standard certification label for Passenger Cars is located as follows: On Lock Face of Left Front Door or Door Pillar; Trucks: Depending on Year and Model, the Rating Plate may be on the Lock Face of the Left Front Door (Conventional Cabs, Econoline and Club Wagons); Inside the Panel of the Glove Box Door (Bronco), or the upper cowl panel (passenger side) in the engine compartment on Cowl units. Stripped Parcel Delivery units have the rating plate in an envelope and it is included in the "boxed items" parts. 1970 thru 1972 Truck Models have the Certification Label attached or riveted to the Rear Face of the Driver’s Door.

NOTE: Tampering, alteration or removal of the Certification Label will cause its destruction or the appearance of the word VOID.

D.S.O. CODES (Special Equipment)

Many vehicles such as police cars, taxis and special order trucks have customer requested equipment installed at the factory, and are identified by a D.S.O. code (Domestic Special Order).

D.S.O. codes have been stamped into truck plates since 1957 and passenger cars since 1962. In addition, all vehicles delivered since January 1962 with special equipment, have a blue envelope in the glove box containing a copy of the Special Equipment Parts List used on that particular vehicle. The selling dealer also has a yellow copy.

A typical D.S.O. number might be 13-0645. In breaking this number down, the (13) indicates the district (in this example, New York) in which the vehicle was delivered. The (0645) indicates it was the 645th vehicle with special equipment delivered for that year. On some plates you may find a D.S.O. number such as (13-) without a second series of numbers. This is NOT a vehicle with special equipment. The number (13), for example, refers only to the District (New York) in which the vehicle was delivered.

To order special equipment parts for vehicles delivered after January 1962, simply use the D.S.O. parts list in the glove box. If this list is not available then use the D.S.O. code on the Rating Plate or the Certification Label. If neither is available, give your Ford or Lincoln-Mercury Parts Manager any information stamped or stenciled on the part you need. He in turn, can then deliver the correct part you request.

Heavy and Extra Heavy Duty trucks built at the Louisville assembly plant between August 14, 1967 and Mid-Year 1970 have a Truck Specification List (T.S.L.) in the glove box. From Mid-Year 1970 and for all 1971 and 1972 truck models you will find a moisture-proof, plastic laminated T.S.L. located as follows: All units except W, WT-9000, F-700, F-750, C and CT series with sleeper compartment and “B”, series Cowl units have the T.S.L. attached to the right hand side of the upper inner back panel.

The W, WT-9000 series have the T.S.L. attached to the right hand side of the heater console.

The F-700, F-750 and C and CT series with sleeper compartment have the T.S.L. attached to the lower rear corner of the right hand door inner panel.

The “B” series Cowl models have the T.S.L. placed in the glove compartment and the customer may attach it in any suitable position on the body or chassis he chooses.
1970-72
FORD and LINCOLN-MERCURY
SAFETY STANDARD CERTIFICATION LABEL

- FORD • TORINO • PINTO • MAVERICK • MUSTANG • THUNDERBIRD
- RANCHERO • COUGAR • MONTEGO • COMET • MERCURY • CONTINENTAL
- MARK III, MARK IV • LINCOLN CONTINENTAL • (CAPRI NOT INCLUDED)

MANUFACTURED BY
FORD MOTOR COMPANY

68-71 THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON DATE OF MANUFACTURE SHOWN ABOVE.

ENGINE CODES

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REAR AXLE RATIO CODES

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(1) 1970-72 Lincoln Continental
(2) 1970-71 Mark III, 1972 Mark IV
(f) Fairlane, Ranchero
(g) Montego
(h) Cougar
(i) 1971-72 Maverick & Comet
(j) 1971 Mustang, Cougar, 1972 Torino, 1970 Maverick, Ranchero, Mustang, Montego, Cougar

1969 FORD and LINCOLN-MERCURY CAR IDENTIFICATION PLATES

ASSEMBLY PLANT CODE
MODEL YEAR CODE
BODY SERIAL CODE
ENGINE CODE (See Chart Below)
CONSECUTIVE UNIT NUMBER
BODY TYPE CODE (Use To Order Body Parts)
COLOR CODE (Use to Order Exterior Paint)
Non-acrylic Enamel—Gray Plate
Acrylic Enamel—Black Plate
Acrylic Enamel—Gold Plate for Lincoln Continental only
TRIM CODE* (Use To Order Interior Trim)

FASTENER PLATE SHOWN. Other plates same except for Mercury or Lincoln Continental logo.

ENGINE CODES

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*Ford only

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Emergency Towing and Starting Tips
EMERGENCY TOWING

Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury Dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

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Be sure to file this and future issues for ready reference. If you have any suggestions for articles that you would like to see included in this publication, please write to: Autolite-Ford Parts Division, Merchandising Services Dept. P.O. Box 3000, Livonia, Michigan 48151.

The information in this publication was gathered from materials released by the National Service Department of Autolite-Ford and the Customer Service Divisions of the Ford Marketing Corporation, as well as other vehicle and parts manufacturers. The descriptions and specifications contained in this issue were in effect at the time it was approved for printing. Our policy is one of continuous improvement and we reserve the right to change specifications or design without notice and without incurring obligation.

Motorcraft

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Livonia, Michigan

SERVICES CALLS ARE BIG BUSINESS

Recent figures show there are 108,300,000 licensed drivers in the U.S.; a little over 62 million are male while 46 million are females. And, because there are a greater number of drivers and cars on the highways (and the number is increasing each year), the number of service calls is also increasing. But even more significant is the fact that a great proportion of owners FAIL TO MAINTAIN THEIR CARS PROPERLY! They often fail or overlook or even ignore getting their engines tuned, batteries checked and tested, cooling systems inspected, or other such simple maintenance needs as fluid level checks.

As a result, service calls are big business!

Is your service outlet prepared to handle just about any kind of an emergency situation? For one thing, you should have a good Towing Rig; one that is equipped with a Towing Dolly, Scotch Blocks, Tow Bar and Sling, and where necessary, wood block adapters (made in advance) for pulling in vehicles with special towing problems.

Some of the more aggressive service outlets even equip their tow trucks with a two-way radio plus a car starter. These car starters are generators powered by a small gasoline engine. Advances made in these gas-engine/generators have almost obsoleted a booster battery and cables. Some of these car starters are also designed to charge a battery and to provide alternating current power for lights and electrically operated tools and other equipment that may be needed on the roadside.

Why not make it a point to review your own service outlet towing equipment and make plans for bringing it up-to-date with more modern methods of handling all types of road emergency calls.

HANDLING THE EMERGENCY CALL

Owners who experience a breakdown on the road, regardless of their car problem, generally tend to be irritable and visibly upset.

Therefore, when a call is received at your service outlet, your main problem at that moment is to attempt to handle the situation as courteously as possible. Treating him (or her) with a calm but firm approach will often turn the owner into a loyal customer who will come in for all his service needs.

Getting off on the right foot is extremely important. Ask for all the necessary information on the nature of the emergency. Simple breakdowns such as a flat tire or "out-of-gas" naturally pose no difficulty. More serious breakdowns require you to ask searching questions. Find out if the owner heard any unusual noises prior to the breakdown. Ask if the engine will "crank over" but will not start. Ask the owner if he noticed any unusual odors such as spilled gasoline (carburetor flooding, fuel line ruptured, etc.).

Often your questioning will reveal if the breakdown is too serious for a roadside repair . . . and the car will have to be towed in to your shop . . . or if it is only a minor problem that can be corrected at the scene. Armed with this information you can decide the best possible method for getting the owner back on "wheels" again. Generally you can also determine the amount of time it will take. Nothing gets an owner "up-tight" faster than a promise to get to his car at a certain time . . . then show up an hour later than agreed upon. It is much better to give yourself some leeway in your emergency scheduling. Showing up earlier makes you look more professional.
When you are called upon to tow a Ford-built passenger car, make sure the parking brakes are released and the transmission gears are in neutral. It is also important to know that the transmission and rear axle are in proper working order before towing. To move a vehicle with damaged or failed rear axle, it is necessary to raise the rear wheels. If the transmission has failed, the driveshaft must be removed or the rear wheels raised, whichever is more convenient.

CAUTION

To tow a vehicle with steering column and transmission locked and no ignition key available, lift vehicle from rear with wheels locked straight. If wheels are locked in a turned position, they MUST BE SUPPORTED with a DOLLY suitable for towing.

If the vehicle is being towed with the rear wheels on the ground, do not exceed 30 mph, or a distance of 15 miles. If this is not possible, it is advisable to tow the vehicle with the rear wheels raised off the ground . . . or with the driveshaft disconnected from the rear axle.

TOWING SLINGS

To avoid metal to metal contact and possible damage to chrome or lower body panels, a special wide-belt sling, similar to that shown in the illustrations below, should be used to lift and tow ALL cars.

The 1971 Maverick and Cougar (also Comet), require one or more 4 x 4 wood block spacers to insure that there is no lifting stress on the lower body panels. The suggested lifting and towing hook-ups and placement of spacers for the above vehicles is illustrated in Figures 2, 3, 4 and 5.

NOTE:

On vehicles equipped with a front end spoiler, the spoiler must be removed when the vehicle is towed from either the front or rear.

Figure 2—Note the position of the 4" x 4" wood block spacer when towing a 1971-72 Maverick from the front of the vehicle.

Figure 3—You do not require a wood spacer block when towing a 1971-72 Maverick from the rear of the vehicle.

Figure 4—Note the position of the 4" x 4" wood block spacer when towing a 1971-72 Cougar from the front of the vehicle.

Figure 5—Note that when you are required to tow a 1971-72 Cougar from the rear, you will need three (3) 4" x 4" wood block spacers positioned as shown.
To avoid metal to metal contact and possible damage to chrome or lower body panels, a special wide-belt sling, similar to the ones shown in figures 6 thru 10 should be used to lift and tow ALL cars.

The 1971-72 Mustang and the 1971 Torino require one or more 4" x 4" wood block spacers to insure there is no lifting stress on the lower body panels. The suggested lifting and towing hookups and the placement of spacers for these two vehicles is illustrated in Figures 6 thru 10.

Vehicles that are equipped with a front end spoiler must have the spoiler removed whenever the vehicle is towed from either the front or rear.

**Figure 6**—Note the position of the 4" x 4" wood block spacer when towing a 1971-72 Mustang.

**Figure 7**—Note that three (3) wood block spacers are required when towing a 1971-72 Mustang from the rear end. The short wood spacers must be positioned under the rear leaf springs with the larger cross-car spacer distributing the towing load at about the midway portion of the shorter spacers.

**Figure 8**—Note the position of the 4" x 4" wood block spacer under the front end of a 1971 Torino. (This is also typical on Montego models).

**Figure 9**—Note that the 1971 Torino (also typical for Montego models), does not need a wood block spacer when towing from the rear end.
DISC BRAKES...
Servicing Tips and Information
DISC BRAKES - SERVICING

Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury Dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

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Be sure to file this and future issues for ready reference. If you have any suggestions for articles that you would like to see included in this publication, please write to: Autolite-Ford Parts Division Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

The information in this publication was gathered from materials released by the National Service Department of Autolite-Ford Parts Division and the Ford Customer Service Division of the Ford Marketing Corporation, as well as other vehicle and parts manufacturers. The descriptions and specifications contained in this issue were in effect at the time it was approved for printing. Our policy is one of continuous improvement and we reserve the right to change specifications or design without notice and without incurring obligation.

A car traveling at 75 mph has a lot of momentum ... just about as much as a car that has fallen from the top floor of a 14-story building. Yet, the car's brake system must be capable of absorbing this tremendous amount of momentum through friction ... all within a few seconds in order to bring it to a safe, quick stop on the highway. Time after time after time!

GENERAL DESCRIPTION

In the automotive passenger car field, disc brakes have only gained wide acceptance in the last few years. However, the idea itself is almost as old as the automobile. In fact, the first patent for a disc type brake was taken out in 1902 (almost 70 years ago) by an Englishman named Dr. Lanchester. Strangely enough, the design he worked out at that time has a striking similarity to the systems in common use today.

It was not until 1953 when Jaguar won at LeMans with a disc-brake equipped car that the American automotive industry started to apply their talents, technical know-how and production capabilities to mass produce a disc brake equipped passenger car.

With disc brakes, as with drum type brakes, the basic principle employed is the harnessing of friction to overcome the motion of the car so that this energy is changed into heat.

With drum brakes the two friction surfaces are the metal drum and specially compounded friction lining material.

Disc brake operation follows this principle to the letter. The mechanical exception is that a circular disc, called a rotor, is used in place of the drum and a clamp-like arrangement called a caliper, which works like a vise, grips the rotating disc when hydraulic pressure is applied to friction pads. The caliper, containing a single piston ... or in some applications more than one piston ... is attached firmly to the front suspension.

And since clearance between the disc and the pads is critical, any slight increase in clearance produces excessive pedal travel. Therefore, in the Ford disc brake system, the brake pad is withdrawn a mere .005" and retained in position by a rubber seal. Because of this method for maintaining the pad-to-disc clearance, wear of the friction material is automatically taken up so that the system is self-adjusting.

Ford-built cars for 1972 use either a single piston floating caliper or a single piston sliding caliper. The sliding caliper type is standard equipment for the front wheels on the Thunderbird, Continental Mark IV, and the Torino and Montego models.

Another version of the sliding caliper type is also a regular production option (RPO) on the Pinto.

The floating caliper type is available as optional equipment for the front wheels on 1972 Ford, Mercury, Mustang and Cougar.
In the development of modern braking systems, the first novel idea for stopping a moving vehicle came with the introduction of the wagon brake shoe. A simple mechanical arrangement of this is shown in Figure 1. It was a crude device and the "shoe" was usually only a piece of curved wood faced with a band of cast iron which was forced against the cast iron rim of a spoked wheel. Mechanical linkage, operated by a lever, was the means for applying this force. For stopping or slowing down a wagon, this was sufficient. However, even for early motorized vehicles, the type of brake described was hardly adequate.

A brake drum was then developed that employed an external contracting brake band as shown in Figure 2. This "wrap around" band lined with friction material resulted in better braking action through increased friction surface area and better mechanical leverages. And, when applied to the rear wheels, this external contracting brake system was a new and effective method for stopping vehicles.

But as automobile popularity and horsepower increased and as roads improved, it was evident that more controlled power was needed for the driver to stop his car safely and smoothly. This led to the development of drum brakes on all four wheels. At first they were external contracting, then internal expanding.

As shown in Figure 3, mechanically actuated, internal expanding brake systems, in their first stage of development, used brake rods connected to a pedal while some used flexible wire cables. Some employed both. When the driver pushed on the brake pedal, the rod (or cable) pulled a camshaft lever at the wheel which in turn rotated a cam and thus expanded the brake shoes against the drum. The mechanical advantage of this arrangement was about 8 to 1 to allow the driver to apply a large amount of force against the brake shoes without great physical exertion.

Next in the evolutionary chain of development came hydraulically operated brake shoes using wheel cylinders and pistons in place of the cam as shown in Figure 4. A master cylinder is used to contain the hydraulic fluid supply, and metal tubing transfers the fluid pressure force equally from the master cylinder to all four wheel cylinders. See Figure 5. This arrangement has been a successful passenger car brake for many years and during this period has undergone many significant engineering changes.

But brake system progress has never stood still. The next major development was the disc brake which gets rid of the brake heat much more readily than a typical drum brake. See Figure 6. First used extensively on heavy military and commercial aircraft, the advantages became apparent for utilization in the modern American passenger car. Namely, better resistance from fade after repeated applications at high speed ... freedom from pulls because the equal clamping action of the brake pads produces more uniform straight-line stops ... and a minimum difference in performance whether dry or wet since the disc throws off moisture through its natural centrifugal action.
DESCRIPTION

The floating caliper assembly shown in the installed position in Figure 7, has two major sections. They are the caliper housing and an anchor plate. This anchor plate is attached firmly to the wheel spindle arm by two anchor plate bolts as shown in Figure 9. The floating caliper is attached to the anchor plate by two steel stabilizers on 1972 Ford, Mercury and Lincoln Continental models, Mustang and Cougar for 1972 use only one steel stabilizer. See Figure 9A.

The floating caliper slides on two steel locating pins which also attach to the stabilizers. Right and left side calipers are not interchangeable. Inside the caliper is a single cylinder and piston assembly. The bore contains a square-sectioned rubber piston seal which is positioned in a groove machined into the cylinder bore and is used to provide sealing action between the cylinder surfaces and piston.

A molded rubber dust boot fits around the piston and seals the cylinder bore from dust and water contamination. See Figure 8. When you compare the outer brake shoe and pad to the inner brake shoe and pad, you will find that the outer assembly is longer and therefore not interchangeable. The outer shoe and pad are fixed to the floating caliper and retained in their position by two steel pins and spring clips. The friction material is riveted (1971-72 models) or bonded (1968-70 models) to a metal plate called the shoe. The shoe and lining assembly is replaced as a unit.

The circular disc, called a rotor, also called a "disc," is cast iron and is ventilated by cooling fins as it rotates with the wheel hub. A splash shield is bolted to the spindle and is used primarily to prevent road splash from contacting the inner surfaces of the disc and shoe pad.

Outer surfaces of the disc are protected from road contamination by the wheel assembly.

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Figure 7 - Here is the "floating caliper" type of disc brake in the installed position.
Figure 8 - A cross section view of the "floating caliper" type of disc brake. Note that the single piston design is similar to that of the sliding type shown on the opposite page.
Figure 9 - This is the "floating" type of disc brake. In this design, the caliper is mounted on the anchor plate in such a manner that it can "float" inboard or outboard as the brakes are applied and released . . . yet held firmly against movement either forward or backward, depending upon the direction of braking forces. Two caliper locating pins hold the caliper in correct position. They extend through rubber insulators which are held in holes in the anchor plate and thread into the ears of the caliper. The caliper is held in position on the anchor plate by two flexible steel stabilizers. Only one stabilizer, as shown in Figure 9A, is used on Mustang and Cougar models.
THE STARTING SYSTEM
...problems and corrections
CRANKING SYSTEM INFORMATION

It's hard to believe but the cranking circuit actually works only about SIX HOURS in an entire year!

That's figured on the cranking circuit operating for approximately 6 seconds each time the engine is started... at an average of 10 times a day. However, even though this system is one of the least operated of all engine accessories, the cranking circuit is a vital part of the overall car operation.

Its job is simple but tough. It must turn the engine over against compression, in all kinds of weather, and fast enough so that the ignition "fires up" and takes over the function of keeping the engine running.

Regular testing and/or checking of the "load" units in the cranking system... the battery, the starter, the cables (and connections), and the relay (or solenoid) ... should be performed on a regular basis.

The "control" units which include the ignition switch and the neutral start switch (when employed) should also receive a periodic visual inspection.

There are a number of things that can happen to the cranking system during the course of a year's operation that have an adverse effect on its performance.

For one thing, excessive current "draw" (caused by a starter in need of overhaul) can obviously reduce battery voltage. If the amount of loss is great enough... causing voltage to the coil to be so weak that the ignition circuit cannot function properly... the engine will either start with great difficulty, or take so long to start that battery voltage is reduced even further.

This cycle will continue to a point at which the cranking circuit will eventually fail to turn the engine over at all.

Another factor that creates poor start, hard start or no start, is excessive voltage drop across other parts or units in the system; this includes the positive and negative battery cables and their electrical connections... the solenoid or relay switch and of course the ground return circuit.

The result of too great a voltage drop at any one of these points may also reduce primary voltage to the ignition coil... thus causing the secondary "high tension" part of the ignition system to operate at a sub-par level.

Naturally the battery, bonding straps and other units in the cranking circuit also have a direct effect on the "easy" starting ability of an engine.

Most of the problems associated with the cranking system are relatively easy to troubleshoot and repair.

This article is intended to help you in that direction. First we'll review basic fundamentals and then present specific test procedures to assist you in locating the causes of cranking system failures.
STARTERS

Ford-built passenger cars use two basic designs of positive engagement starting motors and drives for their power plants. They are the MOVABLE POLE TYPE and the SOLENOID-ACTUATED TYPE.

The first type (Movable Pole) applies to all engines from the 1.6 liter on up to and including the 400 CID while the Solenoid-Actuated type is used with the larger 429 and 460 CID power plants.

NOTE: If the hold-in coil were to open, the starter would still function but the movable metal pole piece would chatter during the overran condition.

This pull-in coil is grounded directly when the pole is in disengaged position so that maximum engagement force can be obtained without armature rotation when the starter is first powered.

When the ignition key is turned to the START position, current flowing through the starter field coils sets up a magnetic action which acts as a pull-in coil to pull the metal pole piece into place. See Figure 3. When this occurs, the fork lever is pivoted and thus slides the drive pinion gear into contact with the ring gear. There is also a fine-wound hold-in coil (see Figure 4), to keep the pole in place during light loads or overran.

As the pole moves into place the drive pinion engages with the ring gear and the direct ground switch is opened. See Figure 5. Then all the field coils are energized normally to operate the starter motor. The motor begins to turn only after the drive pinion is engaged.
STARTER OPERATION
SOLENOID ACTUATED TYPE

This solenoid starter is found on the larger engines in Ford-built passenger cars and light trucks. It uses a forked lever to move the drive pinion mechanism. See Figure 6. However the lever is operated by a pull-type solenoid rather than the movable pole piece used with the movable pole type.

This solenoid coil contains two windings... a pull-in winding and a hold-in winding.

Both windings are energized initially to pull the plunger in... then the pull-in coil is de-energized. See Figure 7 for an electrical schematic of the circuitry in this cranking system.

When the solenoid plunger is all the way in, it closes the main contacts of the load circuit to power the starter motor. See Figure 9. The engine is then cranked.

Thus the solenoid in this type of starter functions as a starter relay as well as a drive actuator. The unit does not require a separate starter relay.

When a separate starter relay is used with this type of starter, there is a link installed on the solenoid to connect the battery terminal to the control terminal. See Figure 10. A replacement starter may or may not have this link... so be sure to transfer it if necessary.

NOTE: If the replacement starter uses a connecting link and the original one does not, remove the link before installing the new starter. Otherwise the starter will begin to crank the engine as soon as the battery is connected.
New V-6 for Capri

Also in this issue:
SERVICE PUBLICATIONS OFFER
INTRODUCTION

Now Capri comes on in a new, more powerful version—with a 2.6-litre (2600cc, 155 cubic inch) V-6 under its bonnet. This snappy performing little engine has a compression ratio of 8.2:1 with a bore of approximately 3½ inches and a stroke of a little less than 2¼ inches. It is an overhead valve design (OHV) not an overhead cam (OHC) as the 2000cc, 4 cylinder engine. Cylinder bores for the V-6 are arranged in a 60-degree V-formation with the distributor located at the rear of the engine. Firing order is unusual (1-4-2-5-3-6) in that the first cylinder on the right bank fires, then the first cylinder on the left bank, then the second cylinder on the right bank, then the second cylinder on the left bank and so forth. The crankshaft rotates in four (4) main bearings with the camshaft turning in four (4) babbitt bearings pressed into the block. Interesting too is the fact that the valves are actuated by solid lifters, steel push rods and individual rocker arms. It’s a beautiful hustler with blackout rocker panels and rear end. Chromed dual exhaust outlets. 185/70 HRx13 (wide tread) radial ply tires. Beefed-up suspension. Full instrumentation, including a tachometer redlined at 5800 rpm. And all this in addition to Capri’s regular list of goodies—like power front disc brakes, room for four, and easy maintenance. Capri V-6 puts it all together and you’ll know it when you’re behind the wheel. Winding through the hairiest turns or over the roughness of a cobbled road you’ll enjoy the sense of solid altogetherness, a tightness of fit and preciseness of handling. Capri’s good looks extend to the interior, with its fully reclinable front bucket seats and other appointments (listed below).

Shown here are the Twin exhaust outlets which are standard with the Capri 2600 V-6 Sport Coupe. Other standard “goodies” include full instrumentation and a 7000-rpm tachometer. Options available are an automatic transmission, sun roof, vinyl top and Decor Group. Except for a radio and air conditioning, which are available as dealer-installed options, that’s just about all any customer wants.
ENGINE DETAILS

The cylinder block of this new V-6 engine is cast iron construction for strength and rigidity with the precision molded cast iron crankshaft supported and carried in replaceable copper alloy bearings.

Babbitt bearings, pressed into the block, support the camshaft which is driven by the crankshaft through helical cut gears.

Both cylinder heads contain the fuel intake and exhaust passages... the intake and exhaust valves... and the rocker arm and shaft assemblies.

Valve guides are an integral part of the heads, while the valves are actuated through solid lifters... steel push rods... and separate rocker arms.

All the coolant passing through the engine flows through the intake manifold and is discharged through a connection at the front. This design permits the coolant to assist in vaporizing the incoming fuel charge in the intake passages.

Lubrication for the V-6 is the pressure type fed by a rotor design oil pump mounted at the rear of the crankcase. Maximum pressure in the system is limited to approximately 50 psi by a non-adjustable spring-loaded relief valve located in the pump body.

A full flow oil filter on the right cylinder bank filters the entire output of the pump before the oil enters the engine lubrication system.

Connecting rods are steel forgings with replaceable copper-lead alloy insert bearings at the bottom end.

Aluminum pistons are used and each has three (3) rings: two are compression rings and one is for oil control. Chrome plating is used on the top compression ring while the oil control ring consists of a center spring and two chrome plated steel rails.

EMISSION CONTROL SYSTEM

The positive crankcase ventilation system is the "closed" design and functions in the same manner as the system used in the 2000cc engine and other domestic Ford-built engines.

A portion of the fresh air flowing into the carburetor air cleaner and filter is routed through a hose to a sealed adapter on the right valve rocker cover. The fresh air is drawn through the rocker cover... the cylinder head and cylinder block passages... and then into the crankcase.

From the crankcase it flows up through the left valve rocker cover... through the hose and the PCV valve... and into the intake manifold to carburetor spacer housing.

The PCV valve is unique in that it is threaded into the spacer housing. However, it should be serviced the same as other PCV valves that are pressed into rubber grommets. Service is accomplished by disconnecting the outlet hose and then unscrewing the valve from the spacer housing.
COOLING SYSTEM

The cooling system for the Capri V-6 engine has some unusual features. For example, it is designed to be a 3-stage system with the thermostat located in the lower left corner of the engine front cover.

Let’s take a moment to review how it works. Coolant enters the radiator at the top and when it reaches the bottom of the radiator, it is drawn into the engine by the centrifugal-type water pump. See Figure 4. Since the thermostat is located at the lower area of the cooling system, it controls the discharge of coolant from the radiator rather than coolant going into the radiator as in a conventional system.

When the thermostat front end is open, coolant flows to the water pump and is then delivered to coolant passages in the front cover of the engine for circulation through the entire engine block.

Coolant delivered to the heater is taken from the coolant outlet housing on the intake manifold when the heater regulating valve is open. Coolant is then returned for recirculation by way of the heater return hose connected to the coolant inlet or thermostat housing. Heat for the automatic choke is provided by a smaller separate hose also connected to the coolant outlet housing at the intake manifold. This is a continuous circuit since the hose is connected to the heater return hose for recirculation. The bypass circuit (from cold temperature to normal engine operating temperature) consists of a hose from the coolant outlet housing on the intake manifold to the coolant inlet housing on the front cover of the engine. Engine cooling is achieved in three stages, as shown on page 5.
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THE SAFETY TWINS

Shocks and exhaust systems take a real beating in the performance of their job. Shock absorbers bounce and jounce millions of times in just a few months while mufflers and pipes are attacked from the inside by hot corrosive gases. These acid-bearing vapors "eat" at the metal from the interior . . . while water, salt and road debris take their toll from the exterior. It's no wonder shocks and mufflers should be checked twice a year and replacements made whenever inspection reveals they no longer are capable of protecting the driver's safety.

And the key word is SAFETY.

Mufflers and pipes that are rotted through are not only noisy but more importantly, they are the direct cause of carbon monoxide poisoning if the exhaust fumes seep into the car's interior.

Shock absorbers that no longer are capable of keeping the wheels firmly to the roadway or that permit the car to sway or lean abnormally are certainly unsafe. In an emergency, these conditions (if not corrected by new shocks) could make the difference between the driver having control of his car or an accident.

GREAT OPPORTUNITY

Shocks and mufflers offer you a great opportunity for increasing your parts and service potential. Everything is in your favor to get your major share of this business before it is lured away by specialists who make up your direct competition.

You have several opportunities a year to spot and point out an exhaust system needing service or replacement, or bad shock absorbers, BEFORE the customer is persuaded to take advantage of high-powered specialty promotions.

The average customer will buy from you because he has confidence in your ability to protect his car and insure his safety. He also comes to you because you are conveniently located.

With all of these factors in your favor, you can't afford getting more of the profitable safety business. But . . . only if you go after it aggressively!

FAST INSTALLATION IS IMPORTANT

With specialty shops advertising 15-30 minute installations you CANNOT AFFORD to tell your customers you need four hours or more of his time. You need to take every short-cut you can and still turn out a professional service job. This issue of Shop Tips is designed to help you in that direction.
AND EXHAUST SYSTEMS

WHAT IS AN EXHAUST SYSTEM?

An automotive exhaust system carries burnt engine gases produced by combustion of fuel/air, to a point that is far behind the driver's area before it releases them to the outside atmosphere.

Secondly, an exhaust system (and particularly the muffler) is also designed to reduce the objectionable noise that is made by the explosion of air/fuel mixture in the combustion chamber to an acceptable level. Because of these two demands, exhaust systems are generally designed to fit a compromise. Engineering departments are capable of reducing noise levels to almost zero . . . if that happened to be the only problem. It isn't! Controlling exhaust noise levels to a minimum and at the same time permitting the engine to breathe easy for top performance is the other factor engineers must contend with.

In general, when exhaust systems go bad, they are almost always noisy. However, new parts are always sold better when sold on the basis of SAFETY . . . not on the condition of sound control.

Motorists who hesitate to spend a few dollars to eliminate a noisy exhaust system muffler or header pipes, will generally spend the necessary dollars more willingly if they are advised that escaping fumes are not only endangering their own personal health but also the lives of others who ride with them.

Ford's exhaust system parts stocking plan (mufflers and pipes) helps you to handle the customers' needs . . . right now! And these needs vary as you will note in the illustrations below.

To cover over 80% of Ford and Lincoln-Mercury car models from 1967 to 1972 all you need have on hand is a minimum inventory of 47 parts for the Ford line and 58 parts for the Lincoln-Mercury line. Ford's new simplified exhaust system parts plan helps you to maintain the right parts at the right place at the right time without a large inventory. And customers who are sold on exhaust system service can be taken care of immediately . . . a big plus in today's fast-moving society. Motorists want their cars back on the road just as soon as possible.

Three basic parts generally make up a passenger car's exhaust system. At the front and attached to the engine exhaust manifold is the EXHAUST INLET PIPE. This pipe carries the exhaust fumes from the engine to the muffler. Some are on the right side of the chassis . . . others on the opposite side . . . some on both sides.

Next comes the MUFFLER which has internal sound-deadening chambers to "Tune" the roar of the exhaust to a more acceptable level; and baffles to also help reduce the noise of the engine explosions. See (A) above.

Behind the muffler is a TAIL PIPE and generally this round metal tubing extends to the rear bumper area.

Some passenger cars with the muffler located right at the rear of the chassis may have no tail pipe because of this particular arrangement. See (B) above.

With some high performance cars you will find dual exhaust systems such as the one illustrated here to gain improved engine performance through freer breathing. See (C) above.

Some higher-priced cars with V-8 engines will have another unit in the exhaust system called a RESONATOR. This device helps to further reduce exhaust noise to a quieter level. See (D) above.
INSPECTION

It takes only a few short minutes to check the entire exhaust system. You should always check for ruptures . . . loose connections . . . or broken parts in an attempt to locate weak spots or grounded or misaligned pipes.

If the muffler is not too hot, feel around the hidden top section of the muffler. Be sure and show the motorist any defects you find and if possible tell him you can have it fixed while he waits. And most importantly . . . ASK HIM FOR THE BUSINESS.

To do this and deliver in the time promised, you must make sure you have all the replacement parts on hand . . . BEFORE you start dismantling the system. Ford and Lincoln-Mercury Dealers offer a complete line of fast-moving exhaust system parts for all Ford-built vehicles.

During your inspection look for kinks or other severe forms of damage in the pipes . . . both the one going into the muffler and the other from the muffler to the rear of the car. See (1). Check carefully where the tail pipe extends over the rear axle. Back pressure in the exhaust system caused by a restriction in the pipes can cause a loss of engine power and is often the primary reason for burnt exhaust valves.

Check for loose end tubes at the muffler body. Check also to make certain these tubes are not broken at the muffler end caps. Observe this area while you attempt to move the muffler by hand. See (3).

Also, check for loose baffles in the muffler. To do this, tightly tap the muffler with your hand or a large rubber-type mallet. If you hear a rattling sound you know that the muffler has broken down internally due to corrosion . . . rust . . . and extremes of moisture and heat. Broken baffles are often the cause of back pressure, especially when they block the free flow of burnt gases.

Look, too, for broken or weakened hangers. Exhaust system parts that are not supported properly are subjected to damaging road shocks and vibrations during the normal course of driving the vehicle. See (4).

NOTE: Any damaged parts of the exhaust system should never be repaired with makeshift . . . unprofessional . . . and temporary materials. Make it a rule to REPLACE any defective mufflers . . . tailpipes . . . intermediate pipes . . . exhaust inlet pipes . . . and hangers . . . with new ones. When you're dealing with a motorist's safety (and that of his family) don't become part of a possible tragedy by making slipshod repairs.

Figure 1—Kinks in any one of the exhaust pipes create back pressure in the exhaust system and can lead to engine damage. Check to make certain the tail pipe is not folded over or collapsed at the end. Damage here may have also caused the pipes to kink and bend severely farther forward since whatever struck or caused the pipe to crush may also have transferred the force up front. See (2).

Figure 2—When damage to the tail pipe occurs here, look at the condition of the pipes forward of the impact. This, too, will restrict the free flow of exhaust gases and create a back pressure condition.

Figure 3—Slight movement of the muffler using hand pressure will often reveal the presence of cracks and small ruptures. Tapping with a rubber mallet will also reveal loose internal baffles.

Figure 4—The exhaust system of a car is primarily a safety device. Muffling the sound of explosions that occur in the combustion chambers is its secondary task. Makeshift methods for repairing weak or ruptured areas in this vital system are not only non-professional but may also endanger the lives of the car's occupants. When exhaust system parts are damaged, rusted through, or split . . . always replace with new units. Ford and Lincoln-Mercury Dealers have a complete line of quality exhaust system parts for all Ford-built cars and trucks.
FORD’S NEW Air Conditioning System... Service Tips
In the past seven years, the number of passenger cars equipped with Air Conditioning systems has mushroomed at a phenomenal rate. For example . . . 1965 industry figures reveal there were 6.8 million (U. S.) registered vehicles with "factory air" and 1.5 million with the "hang-on" type of units.

But, in 1970 . . . car models on the road with factory installed A/C totaled a whopping 21.7 million plus an added 4.3 million with the hang-on type of A/C unit.

Predictions based on solid evidence show that the trend toward A/C in all vehicles is growing by leaps and bounds. Some industry spokesmen say that by 1975 there will be a little over 49,000,000 cars on the road equipped with an air conditioner. Roughly . . . 43 million with factory installed air and 6.1 million with the hang-on type.

That's a whole lot of service business and a whole of a lot of parts that will be needed, plus a staggering amount of Refrigerant-12. When we speak of service on A/C units, we're referring to the fact that air conditioning systems require a periodic maintenance check at least once each year. This includes checking for Refrigerant-12 leakage . . . checking the magnetic clutch action . . . checking compressor drive belt tension . . . cleaning out any leaves, dust and debris from the fins of the condenser . . . checking hose condition and clamp tightness . . . checking compressor mounting and brackets.

You can get a fair share of this enormous service potential by aggressively getting into A/C service and/or installation field. But only if you decide to do so . . . NOW.

Cool air is "hot" business. How hot it gets for your service outlet depends to a great extent on YOU.

There are a number of choices available.

Some service stations and independent garages merely replace Refrigerant-12 in owner's A/C systems. Other outlets get into it in greater depth by offering compressor and clutch service as well, while a growing number are getting into it all the way by servicing the new climate controlled year-round combination A/C and Heater. And there is one additional choice. That is . . . getting into the installation of the "hang-on" type of A/C unit on new and used cars.

Ford offers Custom A/C units of the "hang-on" type that are handsomely styled to complement the interiors of all Ford and Lincoln-Mercury Division passenger cars (except luxury cars), including the light truck lineup. They're ideally suited and priced for economy minded drivers.

Regardless of the depth you intend to get into this ever expanding market, there's no doubt that A/C service and/or installation of such units is BIG BUSINESS . . . CLEAN BUSINESS . . . PROFITABLE BUSINESS.
Car Air Conditioning is the cooling or refrigeration of the air in the passenger compartment. Refrigeration is accomplished by making practical use of THREE laws of nature. These laws of nature and their practical application are discussed in the following paragraphs.

**LAW 1—HEAT TRANSFER**

If two substances of different temperature are placed near each other, the heat in the warmer substance will always travel to the colder substance until both are of equal temperature. For example, a cake of ice in an ice box does not communicate its coldness to the bottle of milk standing nearby. Rather, in obedience to nature's law, the heat in the warm milk automatically flows into the ice which has a lesser degree of heat. See 1.

In order to determine the amount of heat that transfers from one substance to another, science has established a definite standard of measurement called the British Thermal Unit or BTU. One BTU is the amount of heat required to raise the temperature of one pound of water 1 degree F. For example, to raise the temperature of one pound of water from 32 degrees F. to 212 degrees F., one BTU of heat must be added for each degree rise in temperature or a total of 180 BTU's of heat.

And, in order to lower the temperature of one pound of water from 212 degrees F. to 32 degrees F., 180 BTU's of heat must be removed from the water.

**LAW 2—LATENT HEAT OF VAPORIZATION**

When a liquid boils (changes to a gas) it absorbs heat without raising the temperature of the resulting gas. When the gas condenses (changes back to a liquid), it gives off heat without lowering the temperature of the resulting liquid.

For example, place one pound of water at 32 degrees F. in a container over a flame. With each BTU of heat that the water absorbs from the flame, its temperature rises 1 degree F. Thus, after it has absorbed 180 BTU's of heat, the water reaches a temperature of 212 degrees F. See 2.

Here the law of nature is encountered.

Even though the flame continues to give its heat to the water, the temperature of the water remains at 212 degrees F. The water, however, starts to boil or change from the liquid to the gaseous state, and it continues to boil until the water has passed off into the atmosphere as vapor.

If this vapor were collected in a container and checked with a thermometer, it also would show a temperature of 212 degrees F.

In other words, there was a rise of only 180 degrees F. (from 32 to 212) in the water and vapor temperature even though the flame applied many more than 180 BTU's of heat.

In this case, the heat is absorbed by the liquid in the process of boiling and disappears in the vapor. If the vapor were brought in contact with cool air, the hidden heat would reappear and flow into the cooler air as the vapor condensed back to water. Scientists refer to this natural law as the latent (hidden) heat of vaporization.

Water has a latent heat of vaporization of 970 BTU's and a boiling point of 212 degrees F. This means that 1 pound of water at 212 degrees F. will absorb 970 BTU's of heat in changing to vapor at 212 degrees F. The opposite effect is that the vapor will give off 970 BTU's of heat in condensing back to water at 212 degrees F.

This tremendous heat transfer, that occurs when a liquid boils or a vapor condenses, forms the basic principle of all conventional refrigeration systems.

For a liquid to be a good refrigerant, the amount of heat that it absorbs when vaporizing is not the only factor. It must also have a low boiling point. That is, the temperature at which it boils must be lower than the substance to be cooled.

To illustrate with water, place a bottle of milk at room temperature (70 degrees F.) next to boiling water (212 degrees F.). See 3. The heat would flow from the (higher temperature) water to the (lower temperature) milk. The milk would be heated rather than cooled, because the boiling point of water is too high.
In order to make practical use of the heat transfer that takes place when a liquid boils, we must choose a liquid with a low boiling point. Refrigerant-12 is the liquid with a low boiling point. Refrigerant-12 is the liquid most commonly used in automotive air conditioning systems because it boils at 21.7°F. below zero at atmospheric pressure. At elevated pressures, R-12 boils at a higher temperature. Here is a liquid that boils or vaporizes well below passenger compartment temperatures and, in vaporizing, will absorb tremendous amounts of heat without getting any warmer itself.

**LAW 3—EFFECT OF PRESSURE ON BOILING OR CONDENSATION**

**THE TEMPERATURE OF A LIQUID OR VAPOR INCREASES OR DECREASES ACCORDING TO THE PRESSURE EXERTED ON IT.**

In any Ford air conditioning system, liquid refrigerant (R-12) is filtered through the receiver under high pressure. See 4. When the liquid R-12 is released into the evaporator by the expansion valve the resulting decrease in pressure lowers its temperature (usually to about 32 degrees F. which is its boiling point at 30 psig. As the R-12 flows through the evaporator coils, passenger compartment or outside air passes over the outer surface of the coils. As it boils, the R-12 absorbs heat from the air and thus cools the passenger compartment air. The heat from the passenger compartment is absorbed by the boiling refrigerant. The refrigeration cycle is now under way. To complete the cycle, the following remains to be done:

1. Dispose of the heat in the vapor.
2. Convert the vapor back to liquid for re-use.
3. Return the liquid to the starting point in the refrigeration cycle.

The compressor (see 4) pumps the refrigerant out of the evaporator and forces it under high pressure into the condenser which is located in the outside air stream at the front of the car. The increased pressure in the condenser raises the R-12 vapor temperature to a point higher than that of the outside air. As the heat transfers from the hot vapor to the cooler air, the R-12 condenses back to a liquid. The liquid under high pressure now returns to the receiver-dryer where it is once again filtered.

**HEAT AND COOLING**

It may seem difficult to understand how heat can be transferred from a comparatively cooler car passenger compartment to the hot outside air. The answer lies in the difference between the refrigerant pressure that exists in the evaporator and the pressure that exists in the condenser.

In the evaporator, the expansion valve meters the refrigerant flow and thereby reduces the pressure and boiling point below the temperature of the air. Thus, heat transfers from the passenger compartment air to the boiling refrigerant.

In the condenser, the compressor raises the condensation point above the temperature of the outside air. Thus, the heat transfers from the condensing refrigerant to the outside air. The expansion valve and the compressor simply create pressure conditions that permit the laws of nature to function.

**1972 FORD MOTOR COMPANY REFRIGERANT SYSTEM CHANGES**

Some extensive changes have been made in a number of Ford Motor Company passenger car models for 1972. One of these is the method by which the system is evacuated and charged because of the removal of the service valves.

**SCHRADER CHARGING VALVES**

This valve is not new to the refrigeration field. For many years now, it's been known as a Schrader Valve. You'll find this type of service valve (see 5 and 6), on 1971 Lincoln models and on 1972 Lincoln-Continental, Continental Mark IV, Torino and Montego models, both the manual and the automatic temperature controlled systems. 1972½ Ford, Mercury and Meteor models also have this Schrader valve.

**NOTE.** The heating, ventilating, Air Conditioning and Automatic Temperature Control systems for FORD, METEOR and MERCURY passenger car models are carryover from the 1971 model year.
Helping Customers with Trailer Towing Questions
HELPING CUSTOMERS WITH TOWING QUESTIONS

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Motorcraft

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Livonia, Michigan

VOL. 72 MSD 66
LITHO IN U.S.A.

BIG ... BIGGER ... HUGE

Americans are responding to the call of the great outdoors in greater numbers every year. Proof of this is a report by recreation experts who say that the camping industry has grown at least 500% in the past ten years.

Astounding too, is the fact that this newfound approach to "getting away from it all through camping," really did not begin to grow until the late 1950's when the manufacture and sale of recreational vehicles jumped so dramatically.

Today, the RV industry is looking for growth far beyond the 2,500,000 units already on the road.

There are more than 700 manufacturers supplying nearly 10,000 Recreational Vehicle Dealers from coast to coast.

Sources within the industry estimate that the total units on the road (travel trailers, slide-on truck campers, camping trailers and self-powered motor homes), will amount to almost 7,000,000 within the next 5 years.

Of those categories named, probably the most popular is the travel trailer. Roughly half of all the recreational vehicles sold in 1969 (data figures available) were in that specific category.

They vary in dimensions and lengths from the compact 10 to 12 foot models up to elaborate "homes on wheels" that are 30 feet long or more.

Running a close second in the RV market, as shown in the chart, is the camping trailer. They're lightweight, the least expensive, and easily towed by almost any type of passenger car including the small compacts and imports.

RECREATIONAL VEHICLE PRODUCTION ... 1970

(Units and Percentage of Market)

TRAVEL TRAILERS 138,000
CAMPING TRAILERS 116,100
TRUCK CAMPERS 95,900
PICKUP COVERS 91,700
MOTOR HOMES 30,300

WHERE DO YOU FIT IN?

As a service technician, whether you're working in a service station, independent garage, or a car dealer shop, you should become familiar with all aspects of towing travel trailers including factory recommendations for safe towing. And, you should also become knowledgeable about what is needed by the towing vehicle to perform the towing job properly. In that way, your ability to answer technical questions by customers makes you more of a professional in the field of transportation. This issue of Shop Tips will help you in that direction.
Ford provides through production installation Trailering Special Packages to give customers the proper equipment to make their trailer towing enjoyable, safe and trouble-free. There's a balanced package for each vehicle as described in subsequent pages that has been designed and tested for the extra demands made when towing.

The purpose of this issue of Shop Tips is to help make towing more carefree, safe and trouble-free by showing how the marriage of the car to trailer will work in perfect harmony. To do this a number of important factors must be considered.

THE THREE CLASSIFICATIONS OF TRAILERS

Gross Trailer Weight

The class of a trailer is determined by its Gross Trailer Weight, which is the total weight of a loaded trailer ready to roll. It includes the weight of the trailer itself—trailer options (hot water heater, refrigerator, etc.) water—LPG gas—food—clothing—and other personal gear. The chart shows the maximum Gross Trailer Weight for each class.

Tongue Load

"Tongue Load" is the load which the tongue end of the trailer adds to the car by pushing down on the trailer hitch. It's important because it is one of the major factors that affect stability and handling. The tongue load also will play an important role in hitch type selection. Where weight carrying types begin to overload the rear axle system and simultaneously unload the front, a weight distributing or load equalizing type hitch will be necessary.

Each class of trailer requires a certain type of hitch as shown below:

<table>
<thead>
<tr>
<th>TRAILER CLASS</th>
<th>(LIGHT) I</th>
<th>(MEDIUM) II</th>
<th>(HEAVY) III</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS TRAILER WEIGHT UP TO . . .</td>
<td>2000 lbs.</td>
<td>3500 lbs.</td>
<td>6000 lbs.</td>
</tr>
<tr>
<td>TONGUE LOAD UP TO . . .</td>
<td>200 lbs.</td>
<td>500 lbs.</td>
<td>700 lbs.</td>
</tr>
<tr>
<td>TRAILER HITCH TYPE</td>
<td>WEIGHT CARRYING (Simple Ball)</td>
<td>WEIGHT DISTRIBUTING (Load Equalizer)</td>
<td>WEIGHT DISTRIBUTING (Load Equalizer)</td>
</tr>
</tbody>
</table>

SELECTING THE RIGHT FORD-BUILT CAR FOR TRAILERING...

LIGHT: CLASS I . . . UP TO 2000 LBS.
- TRAILER; Class I trailers generally include such units as tent trailers and snowmobiles. Motorcycles are also considered in this classification.
- VEHICLE; Small compact-size cars such as the Ford Pinto and Mercury Capri and Comet are fully capable of towing Class I trailers.

MEDIUM: CLASS II . . . 2000-3500 LBS.
- TRAILER; Class II trailers generally include such units as small single-axle travel trailers and larger boats, such as a 20-foot inboard-outboard.
- VEHICLE; Large passenger cars such as the big Fords, Torinos, Rancheros, Thunderbirds, and big Mercurys, Montegos, Marquis', Monterey, can tow Class II trailers when equipped with Class II Special Trailering Packages, plus required or recommended equipment shown in the charts on pages 8-10.

HEAVY: CLASS III . . . 3500-6000 LBS.
- TRAILER; Class III trailers generally include such units as big two-axle travel trailers that can sleep 6 or 8 and have all the accommodations of home.
- VEHICLE; Large passenger cars such as the big Fords, Torinos, Rancheros, Thunderbirds and big Mercurys, Montegos, Marquis', Monterey, can tow Class III trailers when equipped with Class III Special Trailering Packages, plus required or recommended equipment shown in the charts on pages 8-10.
Once you have found the car's towing capabilities, you must be sure the full weight of the trailer (Gross Trailer Weight) is within the car's towing limit.

If you or the customer don't own a trailer . . . use the chart below to figure the Gross Trailer Weight on the trailer under consideration.

- Ask the trailer dealer for the base weight of the trailer and the weights of the trailer options.

- Estimate the weight of personal equipment you or the customer plan to carry.

- Make sure the Gross Trailer Weight is within the car's capabilities.

If you or the customer own a trailer . . . now is a good time to check its Gross Trailer Weight. Don't guess at it—weigh it, loaded and ready to roll.

**HERE'S HOW TO DO IT**

1. **WEIGH THE CAR'S FRONT AXLE (CF)**

2. **WEIGH THE CAR'S REAR AXLE (CR)**

3. **WEIGH THE LOADED TRAILER (TW)**

4. **WEIGH THE TOTAL CAR (TCW)**

<table>
<thead>
<tr>
<th>GROSS TRAILER WEIGHT</th>
<th>CF 2400 lbs.</th>
<th>CR 2300 lbs.</th>
<th>TW 2500</th>
<th>TCW 4400 lbs.</th>
<th>GTW 2800 lbs. (See Note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TONGUE LOAD</td>
<td>CF 2400 lbs.</td>
<td>CR 2300 lbs.</td>
<td>TCW 4400 lbs.</td>
<td>TL 300 lbs. (See notes 2 &amp; 3)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** Or add TW to Tongue Load (See Note 2)

**NOTE 2:** Or simply put the trailer tongue on a scale while supporting it at hitch height.

**NOTE 3:** If the Tongue Load is more than 15% of the Gross Trailer Weight shift load in the trailer REARWARD to the degree possible to achieve the recommended tongue load for the class of trailer being towed. If less than 10%, shift the load FORWARD.
Emission Control Systems... part 1
EMISSION CONTROL SYSTEMS, Part I

Technical parts and service information published by the Ford Parts Division and distributed by Ford and Lincoln-Mercury Dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

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PART ONE OF A TWO PART ARTICLE COVERING EMISSION SYSTEM OPERATION, DIAGNOSIS, AND MAINTENANCE.

EMISSION SYSTEMS WARRANTY  
CALLS FOR REGULAR MAINTENANCE

By enacting the Federal Clean Air Act, Congress has recognized public demand for clean air. This has required many modifications in automotive engine design.

Purchasers of new Ford-built cars and trucks are notified in a printed booklet accompanying the vehicle that effective performance of the new emission control systems requires regular maintenance. This applies not only to the emission control system itself but also to other engine and fuel system components.

For example, regular emission system maintenance now requires replacement of spark plugs and distributor points each 12,000 miles or 12 months, whichever comes first. At 24,000 miles or 24 months, the distributor cap and rotor and the evaporative emission control canister are to be replaced.

In addition, all emission system components require inspection and testing at prescribed intervals.

To serve your customers properly, you and your men should be aware of the services which owners of affected vehicles must have performed in order to keep their emission system warranties in effect.

THESE CAUTIONS ARE ISSUED TO YOUR CUSTOMERS

(From "An Important Message To Owners of 1972 Ford-Built Cars, Emission Systems Warranty and Maintenance Schedules—Oct ’71.")

"Ford warrants to eligible purchasers that this vehicle: (1) has been designed, built, and equipped so as to conform at the time of sale with the emissions regulations issued under Section 202 (a) of the Federal (U.S.) Clean Air Act applicable at the time of manufacture, (2) is free of defects in material and workmanship which would cause it not to conform with those regulations within a period of 5 years or 50,000 miles, whichever occurs first, when maintained strictly according to the requirements outlined herein.

"By the express terms of the Federal law (U.S.), the required emissions system warranty applies only to vehicles which have been used and maintained according to the manufacturer’s instructions."

This two-part article describes emission system operation, troubleshooting and maintenance. Part I covers operation, diagnosis and maintenance of the IMCO System (Improved Combustion System), and TRS System (Transmission Regulated Spark System). Part II covers the Fuel Evaporative Control Systems, ESC System (Electronic Spark Control System), carburetor adjustments, emission control maintenance and application charts.

For specific details on each vehicle, consult the individual booklet furnished with the car or truck.
INTRODUCTION/IMCO

The Improved Combustion System (IMCO) is an air pollution control, designed to reduce the internal formation of hydrocarbons, carbon monoxide and oxides of nitrogen. This system involves internal engine modifications of the induction and combustion systems. In addition, the carburetor and distributor are modified to provide lean carburetion and ignition timing retard. Together, these changes work to provide a more complete combustion of the air-fuel mixture within the combustion chamber.

IMCO depends on a variety of design modifications tailored to the requirements of each model engine, transmission and vehicle combination. These modifications affect the following:
- Inlet Air Temperature
- Carburetor
- Distributor
- Intake Manifold
- Cylinder Heads
- Combustion Chamber
- Exhaust Manifold

Since the last four items involve design modification only, this article is limited to the items which require periodic service; namely, the inlet air temperature regulator, the carburetor and the distributor.

INLET AIR TEMPERATURE REGULATION

Engines equipped with an improved combustion emission control system incorporate a carburetor inlet air temperature regulator. This device is a part of the air cleaner and keeps the air entering the carburetor at approximately 100°F when under-hood temperatures are less than 100°F. By keeping inlet air temperature at or above 100°F, the carburetor can be calibrated much leaner to reduce hydrocarbon emissions, improve engine warm-up and minimize carburetor icing.

The inlet air regulator consists of a duct and valve assembly attached to the air cleaner. This assembly is connected by a tube to the exhaust manifold shroud. The valve plate is shown here in the up or "heat on" position.

- During engine warm-up, when air entering the air cleaner is less than 100°F, the thermostat is in the retard position, and the valve plate is held up in the "heat on" position by a spring. This allows only air preheated by the exhaust manifold and shroud to enter the carburetor.

- As the temperature of the air increases, the thermostat starts to expand, gradually forcing the valve plate down toward the "heat off" position. When under-hood temperatures reach 100°F, ambient air is permitted to enter the air cleaner directly.
THERMOSTAT OPERATED TYPE

To check the operation of the duct and valve assembly, start with a cold engine and an air cleaner temperature of less than 100°F. Check the valve plate. It should be up in the “heat on” position. If it is not, check for proper installation of the spring and free operation of the plate in the duct. If interference is present, correct by realigning plate.

To check the operation of the thermostat, remove the duct and valve from the air cleaner. Move the valve plate by hand to make sure it does not bind in the duct. Then, immerse it in a pan of water, making sure that the thermostat capsule is covered. Raise the water temperature to 100°F, and allow a few minutes to stabilize the temperature. The valve plate should be in the “heat on” position.

Raise the water temperature to 135°F, and again allow a few minutes to stabilize the temperature. The valve plate should move to the “heat off” position. If the valve plate does not operate properly under these conditions, the duct and valve assembly must be replaced.

Now start the engine. At engine idle, the plate should move to the closed or “heat on” position. Remember, the engine and the air cleaner must be at room temperature or below so the temperature sensing switch will not begin to control the valve plate.

TEMPERATURE SENSITIVE AIR BLEED VALVE

The second type of inlet air regulator uses a vacuum-operated valve plate. The vacuum motor is controlled by a bimetallic temperature sensing switch located in the air cleaner. This unit performs the same function of inlet air temperature control.

When the temperature of the bimetallic switch is below 105°F, enough vacuum is supplied to the vacuum motor to pull the valve plate up to the “heat on” position. As the temperature of the air in the engine compartment increases, the bimetallic spring operates an air bleed in the switch, which decreases the vacuum to the vacuum motor. This allows the valve plate to move down to the “heat off” position.

During acceleration periods when outside air is cold, the low intake manifold vacuum causes the vacuum in the system to drop. The spring in the vacuum motor will override the vacuum and push the valve plate down to the “heat off” position. This permits the ambient air to pass directly to the air cleaner.

VACUUM OPERATED TYPE

To check the vacuum-operated duct and valve assembly, begin with a cold engine that is not running. Under these conditions the valve plate in the duct assembly should be in the open or “heat off” position. If it is not, the valve plate may be binding in the duct and require realignment.

Actual operation of the bimetallic temperature sensing switch can be checked on the car. Remove the top of the air cleaner and the element. Start the engine and observe
Emission Control Systems... part 2
EMISSION CONTROL SYSTEMS, Part 2

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IMPORTANT....
CORRECTION TO THE 1972 MOTORCRAFT & AUTOLITE ALL PRODUCTS CATALOG (FORM AP-205-G)

Inadvertently, the incorrect Motorcraft rotor part number for a Chevrolet Vega was printed on page 40 of the subject catalog. The correct part number is DRG-218, not DRG-208. Please correct your catalog accordingly.

Be sure to file this and future issues for ready reference. If you have any suggestions for articles that you would like to see included in this publication, please write to: Ford Parts Division, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

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PART TWO OF A TWO-PART ARTICLE COVERING EMISSION SYSTEMS OPERATION, DIAGNOSIS, AND MAINTENANCE

THIS ARTICLE COMPLETES EXPLANATION OF EMISSION SYSTEMS FOR 1972 FORD-BUILT VEHICLES

Part 1 of this Series (July 1972 Shop Tips) described operation, diagnosis and maintenance of the IMCO System (Improved Combustion System), and TRS System (Transmission Regulated Spark System).

Part 2 describes fuel evaporative control systems, positive crankcase ventilation, ESC System (Electronic Spark Control System), and related carburetor adjustments on Ford-built vehicles.

Required maintenance operations on emission systems components and other related engine components are also described and illustrated.

A chart is included for quick reference to the required emission system maintenance schedule. (Page 16.)

Application charts are supplied showing you which emission controls are used on various 1972 Ford-built models, including light trucks. (Pages 17 and 18.)

EMISSION SYSTEMS MAINTENANCE IS IMPORTANT TO YOU AND YOUR CUSTOMERS

Maintenance and service of your customers' emission systems is valuable business for you because it includes labor and sales of related engine parts such as spark plugs, points, condensers and distributor caps as well as sales of emission systems replacement components.

Regular maintenance is important to your customers for two reasons:
1. To help keep the car or truck emission systems operating properly, therefore serving their purpose of reducing undesirable emissions.
2. To help keep the engine operating properly, delivering the performance, easy starting and satisfactory fuel economy which are possible when the emission systems are performing properly.

Help your customers maintain good emission systems performance. The result of such maintenance is cleaner air and greater customer satisfaction with their vehicles. This means greater customer satisfaction with you.
FUEL EVAPORATIVE CONTROL SYSTEMS

It is estimated that 20 percent of the overall vehicle emission problem has been caused by gasoline vapors escaping from openings in the fuel tank and carburetor. These gasoline vapors are known as evaporative losses and occur not only when the vehicle is operating, but when it is parked, as well. In fact, most fuel vapors are lost when the vehicle is parked.

This part of emission control is provided by a sealed fuel system wherein the fuel vapors are trapped and directed to the engine, where they are burned in the normal combustion process.

Three basic sub-systems within the system function to provide fuel evaporative emission control. These systems are the:

- Fill Control Vent
- Pressure and Vacuum Relief
- Vapor Vent and Storage

Fill Control Vent System

The fill control vent system provides positive control of fuel height during fill operations by filler pipe design and by vent lines within the filler neck or fuel tank. Of course, fuel tank design will vary to serve specific needs for the many vehicle applications.

This fill control system is designed so that approximately 10 to 12 percent of the tank is empty when the tank is filled to capacity. This space above the fuel allows for heat expansion of the fuel and temporary storage of fuel vapors.

Pressure and Vacuum Relief

The pressure and vacuum relief system functions through a valve in the sealed fill cap. Under normal operating conditions, the fill cap operates as a check valve, allowing air to enter the tank as gasoline is used, while preventing fuel vapors from escaping through the cap.

The valve opens to relieve pressure when it exceeds 3/4 to 1 1/4 psi. When vacuum buildup occurs in the tank the valve opens to allow air into the system. Maximum vacuum at which the cap opens is 1/2 inch of mercury.

Vapor Vent and Storage

The vapor vent system on vertically mounted fuel tanks consists simply of a vapor separator mounted centrally on the uppermost surface of the tank. As mentioned earlier, the 10 to 12 percent space in the tank provides adequate breathing space for the vapor separator.

Horizontally mounted fuel tanks use a raised mounting section for the vapor separator that is centrally located on the upper surface of the tank. This raised section provides additional breathing space for the vapor separator since the space allowed for heat expansion of fuel is not as deep as it is on the vertically mounted tank.
The vapor separator consists of a small hole or opening in the outlet connected to the vapor tube, plus open-cell foam to separate liquid fuel and fuel vapors. It minimizes the possibility of liquid fuel entering the vapor tube.

The fuel vapors that are trapped in the fuel tank have only one place to go and that is through the small opening in the vapor separator and into the vapor tube.

The vapor separator is retained to the fuel tank by the same cam-lock ring used for the fuel tank sending unit. The design shown is the conventional-type vapor separator used for most vehicle applications. Other types are also required because of differences in component usage or vehicle design.

Regardless of the type of vapor separator used, all perform the same function. They serve as a baffle to be sure that only fuel vapors are delivered to the charcoal canister.

If the engine is not operating, the fuel vapors entering the canister are absorbed and stored by the activated charcoal.

On engine start-up, air enters the canister through the center tube that extends to the bottom of the canister. The air circulates through the canister to remove the fuel vapors from the charcoal. This cleansing action is called purging, and it is a good reason for using charcoal, since it is self-cleaning and can be used repeatedly.

From the air cleaner, the fuel vapors are drawn into the carburetor and added to the air-fuel mixture. The air-fuel mixture is then distributed through the intake manifold to each cylinder. The fuel vapors are burned then in the normal combustion process. In this way, fuel evaporative emissions from the fuel tank and carburetor are reduced very substantially.

Another feature of the fuel emission system is that all carburetors are internally vented. The fuel vapors from the carburetor fuel bowl remain within the system until they are drawn into the engine for burning.

**Diagnosis and Service**

Diagnosis of the system, other than fuel tank or fuel vapor line leaks and damaged parts, is limited to locating kinked lines or fill cap malfunction.

Fill cap damage or contamination causing the pressure-vacuum relief valve to be inoperative may result in deformation of the fuel tank; be sure that the correct fill cap is used and is in working order.

Component parts of the fuel emission system, except for the fuel tanks and lines, are not subject to repair. Malfunctioning or damaged parts must be removed and replaced with new parts.